

Appl. No. : 10/624, 728
Filed : July 21, 2003

AMENDMENTS TO THE SPECIFICATION

Please replace paragraph 14 with the following paragraph:

"FIGS. 2A and 2B are is a simplified schematic diagrams of a-pumping systems for a dual chamber substrate processing system, wherein dotted lines denote electrical and electromechanical control and solid lines denote fluid flow, according to one-two embodiments of the present invention;"

Please replace paragraph 16 with the following paragraph:

"FIG. 4 is a graphical representation of timing of preparation and processing phases using the pumping systems of FIGS. 2A and/or 2B."

Please replace paragraph 17 with the following paragraph:

"The dual chamber processing system shown and described herein can include many of the components of the systems shown and described in U.S. Patent Nos. 6,228,773 and 6,273,956. For example, in addition to the components described herein, embodiments of a dual-chamber processing system of the present invention can generally include: a plasma source with a switchable power supply, such as a microwave source or other suitable source; suitable robotic interfaces for loading and unloading wafers and performing other wafer-transfer steps; process gas sources; a venting system for bringing a chamber back to atmospheric pressure after a processing step is complete; and a pumping system for reducing the pressure within the chambers before and during wafer processing. According to one embodiment, the plasma source includes an individual remote plasma applicator associated with each of the chambers, such as a first plasma applicator 81 of a first chamber 60 and a second plasma applicator 82 of a second chamber 62 (Figure 2A). In an alternative embodiment, the plasma source is in situ (Figure 2B), wherein each chamber 60,62 is an in situ plasma reactor. Other additional components can also be used as desired."

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Please replace paragraph 18 with the following paragraph:

~~"Figure 2 illustrates~~ Figures 2A and 2B illustrate one embodiment two embodiments of a pumping system for a dual chamber substrate processing system. Each embodiment ~~The system of Figure 2~~ generally includes a first processing chamber 60 and a second processing chamber 62, which are both served by a single microwave, radio frequency or other common power source ~~(not shown) 84~~ that can be switched between the chambers 60, 62 via a relay and/or microwave switch 83. The illustrated system is designed for synchronously alternating processing of substrates, such that ~~one~~ while one chamber (60 or 62) is performing a processing step, the remaining chamber (60 or 62) can be unloaded of any processed wafers and re-loaded with wafers to be processed. Generally, in the preferred operation of the present system, the processing components operate on only one of the two chambers at any given time."

Please replace paragraph 20 with the following paragraph:

"A first vacuum line 66 connects the pump 64 to the first chamber 60. A second vacuum line 68 connects the pump 64 to the second chamber 62. Isolation valves 70,72 are provided in the vacuum lines 66, 68 to isolate the pump 64 from the chambers 60, 62, as desired. A throttle valve 80 is provided upstream of the pump 64 between the pump 64 and the isolation valves 70, 72 to control a flow rate of gas through the vacuum lines. Additional valves and vacuum lines can also be added as desired, for example, to bypass the throttle valve, etc. In the embodiments of Figures 2A and 2B, a robot 85 is provided for loading, removing, and reloading workpieces into the chambers 60,62 at substantially atmospheric pressure. A computer 86 is configured to repeatedly synchronously and alternately control the power source 84 application, the robot 85 movement, the chamber processing and the pump 64."

Please replace paragraph 25 with the following paragraph:

"The operation of the pumping system embodiments of the present invention will now be described with reference to Figures 2A, 2B and 4. During the processing phase 102 of the first chamber 60, the isolation valve 70 of the first vacuum line 66 is opened and the isolation valve 72 of the second vacuum line 68 is closed, so that the pump 64 communicates with the first processing chamber 60. The throttle valve 80 can be adjusted to regulate the pressure in the first

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chamber 60 during processing by controlling a flow rate of gases drawn out of the chamber by the pump 64.”

Please replace paragraph 28 with the following paragraph:

“As described above, the pump down time is effectively subtracted from the total overhead time of the preparation phase 92 and added to the process phase 102. Accordingly, if it takes roughly 3 seconds to pump down one of the chambers 60, 62, and the process time is roughly 15 seconds, the other chamber has 18 seconds to vent, unload, and reload. Thus, the simplified ~~system-systems~~ of ~~Figure 2~~ Figures 2A and 2B can likely attain nearly the same throughput rate (200 substrates per hour in the example described above) as the more complex and costly system of Figure 1.”

Please replace paragraph 29 with the following paragraph:

“By moving the pump down step from the preparation phase to the processing phase 102, one vacuum pump and two isolation valves of the previous system can be eliminated to provide a substantially less costly system. The layout of the vacuum lines 66, 68 of the ~~system-systems~~ of ~~Figure 2~~ Figures 2A and 2B is relatively simple, thus further cost savings are associated with a reduction of vacuum lines. As a result, the ~~system-systems~~ of ~~Figure 2~~ Figures 2A and 2B ~~is~~ are cheaper and easier to maintain than the previous system. In addition, while the microwave remote plasma source is not utilized during pump down, the vacuum pump 64, which is relatively expensive, is fully utilized and is never idling.”